# Sugar-Sweetened Beverage Intake among College Students:

# A Socio-Ecological Model

Elizabeth Hoffman

Laureen H. Smith (Faculty Mentor)

A thesis submitted in partial fulfillment of the requirements for Honors with Research Distinction degree at The Ohio State University

## Abstract

**BACKGROUND:** Sugar-sweetened beverages (SSBs) are the largest source of added sugar and an important contributor of calories in the American diet. On a typical day, 80% of youth and 63% of adults consume SSBs (CDC, 2010). Additionally, most young adults do not achieve the recommended daily physical activity of 60 min/day. This study examined the consequences of SSB intake among college students. The specific aims of this study were to determine the amount and frequency of SSB consumption by college students and investigate the association of SSB consumption with gender and class rank.

**METHODS:** An exploration of health behaviors (physical activity) was conducted. A correlational design was used to study 82 college students recruited from a residence hall and college of nursing of a large midwestern university. Data was collected via beverage and health surveys.

**RESULTS:** Compared to upperclassmen, students in their first or second year report drinking SSBs more frequently ($t=4.45$, $p=.000$) and more servings per day ($t=4.28$, $p=.000$). Compared to females, males did not differ in SSB consumption but drank more water per day ($t=2.86$, $p=.008$). Comparing actual BMI to perceived body image, most participants under-estimated their actual body size. Sixty percent of males but only 26% of females engaged in at least 60 minutes of physical activity per day.

**CONCLUSIONS:** Efforts to reduce SSB consumption patterns are needed for college students. Wellness initiatives and education on healthy weight status is needed. The contribution of SSBs to excess caloric intake and added sugar to weight gain and resulting health co-morbidities needs further exploration. Reducing SSB intake and increasing physical activity may be a targeted means to impact the weight status of college students.

In recent years, sugar-sweetened beverage (SSB) consumption has attracted increasing attention in the literature due to the negative health and life consequences associated with excessive calories and sugars. The Centers for Disease Control and Prevention [CDC] (2010) defines SSBs to include soft drinks (soda or pop), fruit drinks, sports drinks, tea and coffee drinks, energy drinks, sweetened milk or milk alternatives, and any beverage to which sugar has been added (typically high fructose corn syrup or table sugar). The presumptive consequences of sugar-sweetened beverages have prompted much research and research-based intervention programs aimed at eliminating or reducing SSB consumption (CDC, 2010). The purpose of this study was to examine sugar sweetened beverage intake patterns among college students. Specifically, this study will explore the days per week SSBs are consumed and daily servings of SSBs consumed. The study also will explore other health behaviors and health outcomes among college students including physical activity patterns, perceived stress, fruit and vegetable consumption, water consumption, perceived body image or size, and actual body mass index. Comparisons based on rank in school, living situation, and gender will be conducted.

Prior research on SSB intake in adults and children has linked its consumption with obesity, diabetes, and several demographics such as race, gender, age, and socioeconomic background (Rehm, Matte, Van Wye, Young, & Frieden, 2008). However, significant gaps in the literature exist due to the lack of focus on young adults, particularly young adults attending college. The specific aims of this study are to: a) examine the daily and weekly SSB consumption patterns by young adults attending college; b) examine the relationship between age, rank in school, and gender with SSB consumption patterns; c) explore the relationships between SSB consumption and intrapersonal contexts such as level of stress, dietary patterns, BMI, self-perception of body image, level of physical activity, involvement in organized sports,

and campus living situation and d) examine the relationship between BMI and perceived body image.

## Background and Significance

SSBs are the largest source of added sugar and an important contributor of calories in the American diet. They also have few nutrients (CDC, 2010). Today, SSB consumption is estimated at 224kcal/day (11% of total calories) among youth and 203 kcal/day 99% of total calories) among adults (CDC, 2010). On a typical day, 80% of youth and 63% of adults consume SSBs (CDC, 2010). Per capita, SSB consumption has been found to be the highest among young adults (Bleich, Wang, Wang & Gortmaker, 2008). The CDC (2010) has found that adolescents aged 12-19 are the highest consumers of SSBs with older adolescents or those completing their first or second year of college being highest consumers of SSBs. This is not surprising considering that several social and environmental factors linked to the purchase and consumption of SSBs, particularly with young adults attending college.

### Demographic and Health-Related Factors

A multitude of demographic factors have been examined in relationship to SSB consumption patterns. Findings suggest multifactorial factors may relate to consumption patterns, particularly among younger adults. Persons aged 18-24, men, overweight, and those with less than a college degree have been found more likely to be frequent SSB consumers (Rehm, Matte, Van Wye, Young, & Frieden, 2008). Different demographic factors may relate to SSB consumption for women however findings seem inconclusive. In recent studies, higher SSB consumption was related to lower household income, greater daily television viewing, African-American race, less daily physical activity, and higher BMI in women. (Rehm et al., 2008). These factors were not related to SSB consumption for men (Rehm, et al., 2008). In contrast,

Bleich et al (2008) found that young adults who are African-Americans consumed the most SSBs when compared with White and Mexican American adults, regardless of gender or socio-economic status.

Although there are limited studies regarding SSB by young adults attending college, those that exist propose that a majority of students consume SSBs. West et al (2009) found that 95% of college students reported consuming SSBs in the past month and 65% of students consume SSBs on a daily basis. Further, men were more frequent consumers compared to women (West et al., 2009). Similar to other students focusing on young adults, black college age students have been found to report higher SSB intake compared to whites; younger undergraduate students reported higher SSB consumption when compared to older undergraduate students (West et al., 2009).

Surprisingly, normal weight students have been reported to have significantly greater intake of SSBs compared to overweight students particularly among minority college age students (Huffman & West, 2007). However, a change in weight status during college years has gained increasing recognition. Hoffman and West reported that 74% of students gained weight during their first semester at school (2007). This finding supports that a change in environment such as attending college facilitates weight change, presumably from dietary changes, increased stress, or less regular physical exercise.

The impact of SSB on physical health is not well understood and recommendations to limit SSB are not routinely followed. Adults with diabetes are regularly advised to limit their SSB intake, yet they consume considerable calories from SSBs. In a longitudinal study conducted rom 2003-2006, 45% of adults with diabetes were found to consume SSBs on any given day (Bleich & Wang, 2011). This study further showed that undiagnosed adults with

diabetes were significantly more likely to consume SSBs than diagnosed adults (Bleich & Wang, 2011). Finally, among those diagnosed with diabetes, men consumed more SSBs than women, younger adults more than older adults, non-Hispanic blacks more than whites, and low-income individuals more than higher-income individuals (Bleich & Wang, 2011). These finding mirror previous findings discussed earlier.

**Media**

Media exposure from advertising and promotions gain much attention from adolescents and young adults, particularly those residing on or near college campuses. SSB companies, such as Coco-Cola and Pepsi, fast food restaurants, vending machines, grocery stores, and even convenience stores advertise SSB products via television, print media, magazines, coupons, and in-store displays. SSB advertisement is accompanied by the promotion of an array of other unhealthy meal and snacking options. Among students who use school vending machines, more report buying SSBs more than any other product. Wiecha, Finkelstein, Troped, Fragala, and Peterson (2006) emphasize that vending machines and fast-food restaurants are associated with overall SSB intake. Reducing the availability of these sources in order to change product availability could help in reducing SSB intake (Wiecha et al., 2006).

While advertising may push newer and higher quality sources of SSBs, there are many low-cost brands of soda available for the low-income populations and students (Sichieri, Trotte, Souza, & Veiga, 2008). Yang & Chiou (2010) suggest that raising the cost of less-healthy beverages and reducing the cost of healthier alternatives may reduce the purchase and consumption of SSBs. If healthier beverages are advertised at lower prices and access to unhealthy foods is limited, a shift towards healthier low-fat, nutrient dense food and beverage may occur. In reality, healthful foods increasingly cost more and fast food restaurants have

become increasingly available (Powell, Han & Chaloupka, 2010). Data has revealed that higher fast food prices and greater supermarket availability were related to higher fruit and vegetable consumption and lower BMI (Powell et al., 2010). Further exploration of advertising, pricing, and availability of food and beverage sources could help to decrease SSB purchases and intake.

**Dietary Behaviors**

Increased portion sizes and fast food consumption are typical dietary behaviors of college students; these factors have been linked to increased SSB consumption. In the past 30 years, SSB consumption has increased in all ages from multiple sources including vending machines, restaurants, fast-food establishments, and grocery stores and supermarkets (Rehm et al., 2008). Soft drinks constitute the leading source of added sugars in the diet and exceed the United States Department of Agriculture's recommended total sugar consumption for adolescents (CDC, 2010). SSBs are considered high-glycemic index liquids that increase post-prandial blood glucose levels, decrease insulin sensitivity, and decrease satiety levels-resulting in overeating (Harrington, 2008).

Infrequent breakfast meals, low fruit and vegetable intake, and food insecurity as a result of poverty level are all associated with frequent SSB consumption (Sharkey, Johnson, & Dean, 2011). Between 1977 and 2001, SSB consumption among young adults increased 135% while milk consumption decreased by 38%. These trends were associated with increased portion sizes, more SSB servings per day, and less milk servings per day (Nielsen & Popkin, 2004). In a separate study, increased consumption of SSBs was associated with higher total and abdominal obesity in US adults aged 20-39 years. The higher intake of SSBs was linked to higher energy intake, added sugars and carbohydrates, as well as a lower intake of fiber, orange juice, and low-fat milk (Bermudez & Gao, 2010). There is incentive for better understanding of the

relationships between multiple eating behaviors and SSB consumption, particularly among economically and geographically disadvantaged people, that of which many college students are. College students face various financial challenges including but not limited to tuition, loans, housing, and living expenses. In addition to this often-stressful time of transition, many come from geographically disadvantaged areas with long established dietary patterns. Strategies are needed to educate consumers, particularly college students, on how to moderate SSB intake in order to disrupt the co-occurrence of undesirable eating and promote healthful options.

**Family Factors**

Family factors especially parental influences are associated with SSB consumption patterns of children. Permissive parenting practices, parental SSB consumption patterns, and increased access to SSBs in both the home and school have been linked to the consumption of SSBs of children (CDC, 2010). On a typical weekday, 55-70% of SSBs were consumed in the home environment, while 7-15% of SSB consumption occurred in schools (Wang, Bleich, & Gortmaker, 2008). Studies further show that SSB consumption is increasing among children, adolescents and young adults (CDC, 2010). This finding supports that a strong influence between the home environment and dietary patterns, specifically SSB consumption exists.

Parents have a strong influence on establishing SSB consumption patterns by serving as role models and providing beverage choices to their children. Many young adults and college students who drink SSB frequently and in higher quantities have historically consumed these beverages since childhood. Past and current home environments as well as parenting practices from childhood are factors influencing SSB consumption; family environment has a strong impact on the typical diet and health promotion of young, growing individuals as well as young adults (Huffman & West, 2007). College students living in a new setting with less family

influence and more independence should be provided with dietary education and healthy options. Young adults particularly are at a developmental stage in which they are establishing habits that are likely to endure (Huffman & West, 2007).

**Physical Activity Factors**

It is commonly believed that physical activity helps to protect against chronic diseases including type II diabetes, heart disease, and cancer, as well as mental health (Downs, 2011). Physically active individuals often display other behaviors linked with physical health such as healthier eating habits (Downs, 2011). The CDC (2010) recommends that adults complete a minimum of 75 minutes of vigorous physical activity (VPA) each week. Downs (2011) states that only 35-42% of college students engage in the minimum recommended amount of VPA. This is particularly concerning because VPA typically declines after the age of twenty-four (Downs, 2011). College students appear to partake in less physical activity after transitioning from high school to college.

Downs (2011) further reports that continuously active students reported significantly higher self-esteem, higher positive effect, and lower perceived stress than their less active counterparts. They also reported consuming significantly fewer unhealthy foods and more healthy foods. In this same study, 71% of participants report participating in high school sports but less than 28% participated in college sports (Downs, 2011). A descriptive correlation study in college nursing students found that students with greater BMIs had lower self-efficacy beliefs about regulating their exercise habits (Singleton, Bienemy, Hutchinson, Dellinger, & Rami, 2011). During periods of stress, 68% of students report increased sedentary activities and 30% report a decrease in physical activity (Cruz et al., 2013). These results support the multifactorial and synergistic effect of factors impacting the health of college age adults, particularly a

relationship between mental health and physical health. Physical activity may help to protect the physical and mental health of individuals in college and beyond.

**Body Image**

The first years of college may be critical for body image development. Students begin to make decisions about their health and social life independently of direct adult supervision (Gillen & Lefkowitz, 2011). Gillen and Lefkowitz (2011) state that college students are more likely to develop unhealthy attitudes or behaviors with respect to the body such as: eating more unhealthy foods, binge drinking, or developing friendships with others who are concerned about their looks. Living with or near a cohort of peers that emphasize appearance or unhealthy habits may have a significant influence on the perception of body image. In a study by Gillen & Lefkowitz (2011), male students were found to be more satisfied with their appearance than female students. However, females became increasingly satisfied with their appearance over time. Gillen & Lefkowitz (2011) conclude that body image may improve after taking courses that encourage criticism of unrealistic body images or after engaging in student activities that encourage positive body image.

Racial and ethnicity may influence perceived body image. Caucasians have been found to have more discrepancy between actual body size compared to actual body size, compared to African Americans and Asian Americans (Singleton et al., 2011). For Caucasians, perceived body-image (based on the Stunkard Figure Rating Scale) less accurately matched true weight status (Singleton et al., 2011). Caucasians had more dissatisfaction with weight than Asian Americans and African Americans had higher self-ratings of body image than both Caucasians and Asian Americans. Twenty-seven percent of students were dissatisfied/very dissatisfied with their weight (Singleton et al., 2011). Further, fifty-one percent of students reported weight gain

in college (Singleton, et al). Another component of the study asked men and women to choose the image they believe the opposite gender idealizes. Interestingly, men reported that women would prefer bulkier shapes than the ones they chose; women reported that men would prefer thinner shapes than they chose (Singleton et al., 2011).

**Stress**

Stress among college students, particularly freshmen transitioning into campus life, is a significant problem impacting overall health. Freshmen and especially those living on campus are faced with the pressure to make friends, take responsibility for their own finances, handle the demands of a heavier workload, and do all of the above with little guidance or direction. Stress accumulates when students struggle to balance these new expectations in addition to a search for identity, autonomy, and purpose (Welle & Graf, 2011). Stress can lead to exhaustion, poor self-care, and decreased immunity (Welle & Graf, 2011). In a study conducted by the American College Health Association, 63% of college students report feeling "hopeless" at times, 94% report feeling "overwhelmed", and 48% of females and 39% of males report feeling so depressed it was difficult to function (Welle & Graf, 2011).

Perceived stress may differ by gender and race. In a study by Cruz et al. (2013), women reported higher levels of stress than men. Further, Welle and Graf (2011) found that there was a marked difference in stress tolerance and coping between both gender and race. This suggests that genders and races cope differently with stress and that health education and stress intervention programs may not be effective for all college students.

For college students, stress may differ by overall age or changes in living situations. It has generally been found that as age in years increased, perceived stress levels have decreased (Welle & Graf, 2011). Typical college stressors included: pressure to do well, beginning college,

and change in living condition. In addition to these stressors, 94.8% of college students reported stress from a change in sleeping habits. Further, 64.9% of students reported not spending as much time with their parents as they would like. Nearly half or 42.3% of college students reported having difficulty with their roommate. Popular coping mechanisms utilized by college students to reduce perceived stress included getting eight or more hours of sleep, having enough leisure time, balanced diet, avoiding problems with a substance, and being involved in an extra-curricular sport (Welle & Graf, 2011). Only 60% of college students reported that physical activity is an effective coping mechanism for stress (Cruz et al., 2013).

**Significance**

It is ostensible that young adults are vulnerable to weight gain and weight gain while attending college can be significant. A national representative sample indicates that 35% of college students are obese (Huffman & West, 2007). Various interrelated factors impact the health and health behaviors and attitudes of this age group. It is important to recognize the contribution of SSBs to calories and sugars that lead to this weight gain and resulting health concerns. If consumption patterns exceed recommendations, reducing SSB intake may be one simplistic behavior change to impact dietary behaviors to reduce obesity prevalence among young adults in the United States (Nielsen & Popkin, 2004). By promoting healthful dietary patterns in college students, healthier lifestyle patterns are established in adulthood and perhaps future generations. Health care professionals bear a responsibility to assist parents and youth alike to target suboptimal dietary patterns in order to recognize and eliminate excess calories to prevent obesity and other conditions associated with consumption of SSBs.

Other health conditions associated with SSB consumption include diabetes, elevated triglycerides, cardiovascular disease, non-alcoholic fatty liver disease, elevated uric acid levels,

gout, and dental caries (CDC, 2010). These same conditions are generally accepted comorbid conditions of obesity (CDC, 2010). Fortunately, young adults have much independence in their daily lives, particularly those whom rely on themselves in a college atmosphere. Thus, they are given the opportunity to take responsibility for their health and are able to modify behaviors that may negatively impact their overall well-being.

The difficulty in eliminating SSBs comes from their ubiquity, low cost, and taste appeal (Striegel-Moore et al., 2006). Fortunately, SSB consumption is a modifiable behavior. Changes in behavioral strategies and environment context may help to reduce SSB consumption. As with many behavioral change approaches such as social cognitive theory, personal goal setting (such as not keeping SSBs in the home), reaching behavioral targets, and monitoring outcomes assist with reducing daily SSB consumption patterns. Since many individuals find that they must utilize a multi-factorial approach to combat weight gain or obesity, a similar approach may impact SSB consumption.

Young adults and particularly college age students are a promising audience for focused behavioral interventions directed at reducing SSB consumption (Huffman & West, 2007). Unfortunately, little attention has been given to college students SSB consumption; young adults in general are not the focus of obesity prevention and lifestyle improvement efforts. Little of the research on SSB intake has examined consumption patterns of SSBs by college students, despite the vulnerabilities of this population to weight gain (West et al., 2009). This study addressed some of these gaps and limitations by focusing on SSB consumption by young adults, specifically college students. This study will further explore SSB consumption patterns during childhood, resulting consequences, and provide us with a foundation for evidenced-based interventions aimed at college students to change SSB consumption patterns.

This study has four research questions:

a. What are the daily quantity and weekly frequency of SSB consumption by college age students?
b. What is the relationship between demographic factor of class rank and gender, and SSB consumption?
c. Is there a relationship between BMI and perceived body image?
d. Is there a relationship between SSB consumption and intrapersonal contexts: level of stress, fruit and vegetable consumption, BMI, perceived body image, physical activity, involvement with organized sports, and campus living situation?

## Methods

This is a descriptive and correlational study using a convenience sample to provide data on health statistics and sugar-sweetened beverage consumption. Data were collected during the fall semester at a large, public Mid-western university. Data were collected at two campus locations: a dormitory and the College of Nursing. Data were provided via self-report on health behaviors, beverage consumption patterns, and health outcomes. Descriptive and inferential analyses were conducted. Measures of central tendency including means, standard deviations, and range were conducted on all variables of interest. To examine group differences, ANOVA and independent t-tests were conducted; $p<.05$ was established at the level of significance. SPSS Statistical Software, version 19.0 was used for all data analysis (IBM, 2013).

### Participants

The sample consisted of 85 college students attending a large Midwestern university, ranging in age from 18-24 years with a mean age of 19.7 years (SD=1.41). Participants of this study were predominantly female (75.6%), lower-classmen (61.4%), and Caucasian/White (93.9%). Most participants (90.2%) were from the State of Ohio and the nearly half (44.4%) of

students live off campus. An additional 13.6% of participants were daily commuters to campus. The remaining 37.5% of participants lived in on-campus housing and residence halls. See Table 1 for sample demographics.

**Measures**

*Descriptive Variables.* Demographic variables included: gender, age, class rank, campus residence, and race. The ages of participants were reported in years and gender was selected as either male or female. Racial categories included: Caucasian/White, Black/African American, Native American, or Other. Ethnicity categories included: Hispanic/Latino or Not Hispanic/Latino. Living Situation categories included: dorm, on-campus housing, off-campus housing, or commuter. Demographic data was collected by asking, "Are you from Ohio? If yes, what county?" Rank categories included: 1st year, 2nd year, 3rd year, and 4th year.

*Health.* General health was measured by asking, "In general, would you say your health is excellent, very good, good, fair or poor?" In addition, subjects were asked to self- report their weight in pounds (without shoes) and height in feet and inches (without shoes). From the self-reported height and weights, adult Body Mass Index was calculated using the CDC Adult Body Mass Index Calculator program (CDC, 2011). Co-morbid conditions of obesity were measured by a diagnosis of diabetes mellitus and hypertension. Subjects were asked: "Have you ever been told by a doctor or any other health professional that you had diabetes or sugar diabetes?" Responses were: yes, no, borderline, or don't know. Yes was coded as "1"; No was coded as "0"; Borderline was coded as "3"; and do not know was coded as"4". Subjects were asked:" Have you been told by a doctor or nurse that you have high blood pressure?" Responses were: yes, no, borderline, or don't know. Yes was coded as "1"; No was coded as "0"; Borderline was coded as "3"; and do not know was coded as"4".

.

*Physical Activity*. Physical activity was measured by asking, "On a typical week, how much daily physical activity do you do?" Responses ranged from less than 30 minutes to more than 60 minutes in my normal daily routine. Participants were asked, "Do you participate in organized sports such as a member of a school team? IF YES, how often do you practice or participate each week?"

*Perceived Stress Level.* Perceived stress level was measured by a single item that asks, "Would you describe your stress level as high, normal, or low?" The item was coded so that higher values indicated a higher level of perceived stress.

*Perceived Body Image.* Perceived Body image was measured by the use of the Stunkard figure rating scale. This scale has established validity and reliability when used with both males and females during young adulthood (Stunkard, Sorensen & Schalsinger, 1983). Body image was measured by asking, "How would you describe your self-perception of body image?" Participants then circled an image corresponding to their gender.

**Beverage Survey.** A separate beverage survey consisted of 10 items regarding SSB preferences, availability, and frequency of SSB and water intake. Participants were first asked to select where they obtain regular soda/pop, iced tea, fruit drinks, sports drinks, energy drinks, or other sweet drinks. Choices included: vending machines on campus, local or corner store, grocery store such as Kroger's or Target, dining hall, school's snack room, I bring them to campus (packed), I do not drink any sweetened drinks, and other.

Participants were next asked how often they drink SSBs in a typical week. Categories included: every day, at least 5 days a week, 3-4 times a week, 1-2 times a week, less than once a week, and never, I do not drink sweetened drinks. The following questions were fill-ins asking how many cups of water the student drinks per day, how many sweetened drinks the student

drinks per day, at what age the student began drinking SSBs, and which sweetened beverage the student drinks the most. Participants were asked to answer yes or no to whether drinking healthy beverages is important to them and if campus has healthy drink options available. Subjects were asked, "How often did you drink SSBs growing up?" Selections included daily, weekly, on special occasions, and never.

Lastly, subjects were asked to rank their favorite drinks starting with "1", most favorite drink, "2", next favorite, etc. and to name their favorites of each category. Choices included: water, low fat or skim milk, diet or sugar-free soda, fruit juices, iced tea or sweet tea, sports drinks, regular soda, energy drinks, and other.

**Procedure**

The recruitment process began by distributing flyers about campus to advertise times and locations at which the survey would be conducted. Surveys were completed at two approved university locations, including a residence hall and the College of Nursing. A multitude of students travel through these building daily, either to study, meet with friends, or grab a bite to eat. These locations were chosen because of their ability to attract the masses and include a diverse sample of the student population. The survey was carried out on two occasions, once at the College of Nursing, and once at the residence hall. Flyers advertised a $2 reward as an incentive to complete the surveys.

Distribution and completion of the surveys involved a single table stationed in a centralized location of the dorm and College of Nursing. Signs directed students to the survey location. Survey packets were handed out at the table, at which the students could sit and take time to complete the survey. A consent form accompanied each survey. The surveys combined took approximately 10 minutes to complete. Following submission, the individual was rewarded

$2 and a water bottle. Once a sufficient number of surveys were collected, data collection ceased.

## Results

Students reported purchasing SSBs from school vending machines (19.4%), a corner store (21%), the grocery store (56.5%), the cafeteria (35.5%), a snack room at school (3.3%), and home (13.1%). SSBs consumed most often include pop/soda (31.8%), juice (20.5%), sports drinks (20.5%), and iced tea (18.2%). 86.3% reported that campus has healthy beverage options available. The average age students began drinking SSBs is 7 years old; M=7.26 (SD=3.59). The majority of students drank SSBs weekly growing up.

*What are the daily quantity and weekly frequency of SSB consumption by college age students?* Students reported that they do not drink SSBs (19.5%), drink SSBs less than once a week (30.5%), drink SSBs 1-2 times a week (19.5%), drink SSBs 3-4 times a week (17.1%), drink SSBs at least 5 days a week (6.1%), or drink SSBs every day (7.3%). Students reported drinking 0 SSBs per day (41.1%), 1 SSB per day (37%), 2 SSBs per day (13.7%), 3 SSBs per day (5.5%), or 4 or more SSBs per day (2.7%).

*What is the relationship between demographic factor of class rank and gender, and SSB consumption?* Compared to females, males did not differ in SSB consumption but drank more water per day (t=2.86, p=.008). Compared to upperclassmen, lower classmen report drinking SSBs more frequently (t=4.45, p=.000) and more servings per day (t=4.28, p=.000). Only 6.2% of upperclassmen report drinking SSBs 3 or more times per week, compared to the 42.6% of lowerclassmen. 31.9% of lowerclassmen report drinking 2 or more SSBs per day, compared to 3.8% of upperclassmen.

*Is there a relationship between BMI and perceived body image?* A significant finding was the association between BMI and perceived body image. Many subjects (44%) under-

estimated their true weight status. For example, participants with a BMI considered overweight or obese often perceived themselves as healthy weight or even underweight. Additionally, the majority of participants reported having "good", "very good", or "excellent" health (96.4%). These results were surprising.

*Is there a relationship between SSB consumption and intrapersonal contexts: level of stress, fruit and vegetable consumption, water consumption, BMI, perceived body image, physical activity, involvement with organized sports, and campus living situation?* Interestingly enough, upperclassmen report markedly higher levels of stress. 64.3% of upperclassmen report high stress, while only 39.2% of lowerclassmen report high stress levels. Lowerclassmen drink SSBs not only more frequently than upperclassmen, but have more servings per day. This data may demonstrate that there is little correlation between stress and SSB consumption. 27.8% of males reported having high stress, while nearly twice that (54.1%) of females reported having high stress. Males and females had similar SSB consumption.

Students were found to have minimal fruit and vegetable consumption. 55% of males and only 12.9% of females drink the recommended daily water intake of 8 cups. More detailed nutrition research could be utilized to evaluate a relationship between diet and SSB consumption.

60% of males and only 26% of females engaged in at least 60 minutes of physical activity per day. From the overall sample, only one-third (34.1%) receives the recommended daily physical activity. 18.3% report participation in organized sports with the majority of those (50%) participating only once each week. The majority of participants live off-campus (44.4%), 38.3% live in dorms, and the remaining live on-campus or commute.

Health status of young adults must be examined. 3.6% of participants report having borderline or confirmed diabetes and 11% report having borderline of confirmed hypertension.

While these numbers are not startling, they are of concern. Overall, most college age students exceed the recommended daily intake of SSBs. Although, 84% of students reported that it is important to them to drink healthy beverages. This may demonstrate a desire to live a healthy lifestyle but a lack of education. In order to promote the health of young adults, nutrition, physical activity, and stress management must be addressed in addition to SSB consumption.

## Discussion

During college, students experience numerous social and environmental changes. These changes involve increased independence in daily living and decision making in all domains, including health (Gillen & Lefkowitz, 2011). All students, regardless of gender or race, experience common changes during college, such as: living in close quarters, similar food choices, student activities, class work, and parties. Most students likely have increased exposure to people who differ in physical appearance and health behaviors and attitudes. Providing health education at this time of development and growth may have an everlasting impact on the health of these individuals.

Three important findings emerged from this study. First, our study did not support gendered differences in SSB consumption; this finding differs from previous literature. Compared to females, males did not differ in SSB consumption but consumed more water per day. This was an unexpected finding and further research may investigate the reasons for why males consume higher amounts of water. Additionally, males reported lower levels of stress and greater participation in physical activity. This can be supported by various studies that demonstrate a relationship between increased physical activity and lower stress levels. This finding possibly demonstrates that males more often utilize physical activity as a coping mechanism for stress or on the contrary, are more concerned about body image.

Second, there was a significant class rank comparison. Compared to upperclassmen, lower classmen report drinking SSBs more frequently and more servings per day. Yet, upperclassmen report markedly higher levels of stress. This finding is surprising, considering the numerous stressors that lowerclassmen face during the transition from high school to college. It is assumed that upperclassmen have had time to acclimate themselves to a new environment with new expectations and responsibilities. Upperclassmen are expected to have adjusted to changes and developed their own unique coping mechanisms for stress. Previous research reports higher stress among lowerclassmen. Reports of higher SSB intake and lower stress among lowerclassmen may indicate that there is little association between stress and SSB intake.

Third, a significant finding was the association between BMI and perceived body image. Many subjects under-estimated their true weight status. For example, participants with a BMI considered overweight or obese often perceived himself or herself as healthy weight or even underweight. This was another surprising finding. We often assume that Americans over-estimate their true weight status. This finding may indicate a need for education on appropriate weight status for young adults (adjusted for age, gender, and height).

Efforts to reduce SSB consumption patterns are needed for college students. Little research on SSB intake has examined consumption patterns of SSBs by young adults despite the vulnerabilities of this population to weight gain. This study demonstrates the need for wellness initiatives and education on appropriate and healthy weight. It is important to recognize the contribution of SSBs to excess calories and sugars that may lead to weight gain and resulting health co-morbidities. Reducing SSB intake, increasing physical activity, addressing perception of body image, and controlling stress may be a targeted means to impact the weight status of college students.

In the future, diet and exercise interventions can be implemented within the university. Colleges and communities should determine ways to increase physical activity in young adults in order to promote both physical and mental health. It would be beneficial to develop a collaborative project between professional schools, such as nursing, medicine, dentistry, and public health, to further measure health indices and create interventions for building a healthier student population and community. A pilot-study could be initiated at the College of Nursing to test the efficacy of interventions.

**Limitations**

The sample for this study was a convenience sample consisting primarily of lowerclassmen white females from the College of Nursing. This limitation should be considered when generalizing the findings. Further, the sample lacked sufficient male participants to conduct inferential analysis of gendered differences. All measures were self-reported. Consequently, the calculation of BMIs may not be accurate since self-reported age, height and weights were used to complete the calculations.

## Conclusion

Obesity and associated health co-morbidities are a serious problem for this nation. Educating college students to limit SSB intake and practice other healthy behaviors could significantly impact their physical and mental health. This study has many implications for nursing practice. Areas of education aimed at young adults should include nutrition, the benefits of physical activity, health consequences associated with SSB intake, and stress management. Going forth, questions to be further examined include 1) Why do you drink SSBs? Do you drink SSBs for their taste appeal, caffeine, availability, or pricing? 2) Do you wish to either decrease your SSB consumption or live a healthier lifestyle? 3) Do you understand the health consequences associated with drinking SSBs? and 4) What type of interventions do you feel

would be must successful in decreasing SSB consumption in young adults? Further studies may help to identify targeted means for addressing the overconsumption of SSB consumption in young adults, particularly college students.

**HUMAN SUBJECTS APPROVAL STATEMENT**

This study was approved by The Ohio State University Social and Behavioral Sciences Institutional Review Board.

## References

Bermudez, O.I. & Gao, X. (2010). Greater Consumption of Sweetened Beverages and Added Sugars is Associated with Obesity among US Young Adults. *Annals of Nutrition and Metabolism.*

Bleich, S.N. et al., (2008). Increasing consumption of sugar-sweetened beverages among US adults: 1988-1994 to 1999-2004. *The American Journal of Clinical Nutrition.*

Bleich, S.N. & Wang, C., (2011). Consumption of Sugar-Sweetened Beverages Among Adults with Type 2 Diabetes. *Diabetes Care*, 34(3).

Centers for Disease Control and Prevention (2010). *The CDC Guide to Strategies for Reducing the Consumption of Sugar-Sweetened Beverages*, 1-41.

Centers for Disease Control and Prevention (2011). Adult BMI Calculator: English. Retrieved from http://www.cdc.gov/healthyweight//bmi/adult_bmi/english bmi_calculator/bmi_calculator.html

Chin-Yang, C. & Chiou, W.B. (2010). Substitution of healthy for unhealthy beverages among college students. A health concerns and behavioral-economics perspective. *Appetite*, 54: 512-516.

Cruz, S.Y. et al., (2013). Physical activity and its associations with sociodemographic characterisitics, dietary patterns, and perceived academic stress in students attending college in Puerto Rico. *Puerto Rico Health Science Journal*, 32(1): 44-50.

Downs, A., (2011). Vigorous Physical Activity, Sports Participation, and Athletic Identity: Implications for Mental and Physical Health in College Students. *Journal of Sport*

*Behavior*

Gillen, M.M. & Lefkowitz, E.S., (2011). Gender and racial/ethnic differences in body image development among college students. *Body Image*, 9:126-130.

Harrington, S., (2008). The Role of Sugar-Sweetened Beverage Consumption in Adolescent Obesity: A Review of Literature. *The Journal of School Nursing.*

Huffman, L. & West, D.S., (2005). *Readiness to change sugar sweetened beverage intake among college students*. *Eating Behaviors*, 8, 10-14.

Nielsen, S.J. & Popkin, B.M., (2004). Changes in Beverage Intake Between 1977 and 2001. *American Journal of Preventive Medicine*, 27(3): 205-210.

Powell, L.M., Han, E., Chaloupka, F.J., (2010). Economic Contextual factors, food consumption, and obesity among U.S. adolescents. *Journal of Nutrition*

Rehm, C.D. et al., (2008). Demographic and Behavioral Factors Associated with Daily Sugar-sweetened Soda Consumption in New York City Adults. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 85(3): 375-384.

Sharkey, J.R. et al., (2011). Less-healthy eating behaviors have a great association with a high level of sugar-sweetened beverage consumption among rural adults than among urban adults. *Food and Nutrition Research.*

Sichieri, R. et al. (2008). School randomized trial on prevention of excessive weight gain by discouraging students from drinking sodas. *Public Health Nutrition*, 12(2): 197-202.

Singleton, E.K et al., (2011). A Pilot Study: A Descriptive Correlational Study of Factors Associated with Weight in College Nursing Students. *The ABNF Journal*, 89-94.

Striegel-Moore et al. (2006). Sugar-Sweetened Beverages, Milk Intake, and Obesity in

Children and Adolescents. *The Journal*, 152-154.

Stunkard AJ, Sorensen T, Schulsinger F, (1983). Use of the Danish Adoption Register for the study of obesity and thinness. *Res Publ Assoc Res Nerv Ment Dis*, 60:115–120.

Wang, Y.C., Bleich, S.N., Gortmaker, S.L. (2008). Increasing Caloric Contribution From Sugar-Sweetened Beverages and 100% Fruit Juices Among US Children and Adolescents, 1988-2004. *Pediatrics*, 121(6): 1604-1614.

Welle, P.D. & Graf, H.M., (2011). Effective Lifestyle Habits and Coping Strategies for Stress Tolerance among College Students. *American Journal of Health Education*, 42(2): 96-104.

West, D.S. et al. (2006). Self-Reported Sugar-Sweetened Beverage Intake among College Students. *Obesity*, 14(10): 1825-1830.

Wiecha, J.L. et al. (2006). School vending-machine use and fast-food restaurant use are associated with sugar-sweetened beverage intake in youth. *Journal of American Diet Association.*

Table 1: Demographic Description of Sample

| Variable | N | Percentage |
|---|---|---|
| Gender | | |
| Male | 20 | 24.4% |
| Female | 62 | 75.6% |
| Race | | |
| Caucasian/White | 77 | 93.9% |
| African American/Black | 1 | 1.2% |
| Other | 4 | 4.9% |
| Class Rank | | |
| First Year Student | 25 | 30.5% |
| Second Year Student | 29 | 35.4% |
| Third Year Student | 13 | 15.9% |
| Fourth Year Student | 15 | 18.3% |
| Living Situation | | |
| Dorm | 31 | 38.3% |
| On Campus | 2 | 2.5% |
| Off Campus | 36 | 44.4% |
| Commuter | 11 | 13.6% |

Table 2: Variables of Interest

| Variable | N | Percentage |
|---|---|---|
| I do not drink SSBs | | |
| No | 61 | 74.4% |
| Yes | 21 | 25.6% |
| SSB consumption (per week) | | |
| I do not drink SSBs | 16 | 19.5% |
| Less than once | 25 | 30.5% |
| 1-2 times | 16 | 19.5% |
| 3-4 times | 14 | 17.1% |
| At least 5 days | 5 | 6.1% |
| Every day | 6 | 7.3% |
| SSB consumption (per day) | | |
| 0 | 30 | 41.1% |
| 1 | 27 | 37% |
| 2 | 10 | 13.7% |
| 3 | 4 | 5.5% |
| 4 or more | 2 | 2.7% |
| Drinking healthy beverages is important | | |
| No | 13 | 16% |
| Yes | 68 | 84% |

| | | |
|---|---|---|
| Childhood SSB consumption | | |
| Never | 5 | 6.2% |
| Daily | 14 | 17.3% |
| Weekly | 39 | 48.1% |
| Special occasions | 23 | 28.4% |
| Campus has healthy beverages | | |
| No | 11 | 13.8% |
| Yes | 69 | 86.3% |
| Physical activity (per day) | | |
| Less than 30 min | 23 | 28% |
| 30-60 min | 31 | 37.8% |
| More than 60 min | 28 | 34.1% |
| Described health | | |
| Poor | 1 | 1.2% |
| Fair | 2 | 2.4% |
| Good | 21 | 25.6% |
| Very Good | 38 | 46.3% |
| Excellent | 20 | 24.4% |
| Organized sport participation | | |
| Yes | 15 | 18.3% |
| No | 67 | 81.7% |

| | | |
|---|---|---|
| Organized sports participation (per week) | | |
| Once | 7 | 50% |
| Twice | 2 | 14.3% |
| 3 times | 3 | 21.4% |
| 4 times | 1 | 7.1% |
| 5 or more times | 1 | 7.1% |
| More than one kind of fruit (per day) | | |
| Seldom | 14 | 17.1% |
| Sometimes | 27 | 32.9% |
| Most of the time | 22 | 26.8% |
| Almost always | 19 | 23.2% |
| More than one kind of vegetable (per day) | | |
| Never | 1 | 1.2% |
| Seldom | 12 | 14.6% |
| Sometimes | 31 | 37.8% |
| Most of the time | 20 | 24.4% |
| Almost always | 18 | 22% |
| Daily SSB consumption | | |
| Never | 26 | 32.5% |
| Seldom | 28 | 35% |
| Sometimes | 16 | 20% |
| Most of the time | 6 | 7.5% |
| Almost always | 4 | 5% |

| | | |
|---|---|---|
| Diagnosed diabetes | | |
| No | 79 | 96.3% |
| Borderline | 1 | 1.2% |
| Don’t Know | 2 | 2.4% |
| Diagnosed hypertension | | |
| No | 73 | 89% |
| Yes | 3 | 3.7% |
| Borderline | 6 | 7.3% |
| Stress level | | |
| Low | 2 | 2.5% |
| Normal | 39 | 49.4% |
| High | 38 | 48.1% |
| Self-perception of body image | | |
| Underweight | 1 | 1.2% |
| Slightly underweight | 18 | 22% |
| Normal weight | 33 | 40.2% |
| Overweight | 23 | 28% |
| Obese | 7 | 8.5% |